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DOUGLAS FIR BEETLE MIGRATION EXPERIMENT

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Douglas Fir Beetle Migration Experiment

by

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Purpose:

To show the distance of spread of Dendroctonus pseudotsugae Hopk. from a known locality of concentrated population.

Method:

During 1950, a small timber sale of about 160 acres was logged at Windermere Creek (See Figure 1). This was the first logging disturbance in the immediate locality. Logging and fire disturbance has occurred in adjacent valleys, but these have been isolated by high ridges. Douglas fir formed the largest portion of the cut, while the surrounding forest type was predominantly Douglas fir-lodgepole pine. All cutting ceased in the spring of 1951 so that by 1952 emerging Douglas fir beetle adults had no further slash material in which to breed. This population could only be classed as "light to moderate". The insect was in the teneral adult stage in early May.

Originally it was intended to cut four lines of trap trees in the cardinal directions and radiating from the logged area. Due to the impending emergence period and to the pressure of the main work of the summer, this was not possible. As a result, only one line was felled running due south of the area. Douglas fir of uniform size were felled at 0, 5, 10, 20, 40 and 80 chains south of the southern boundary of the slash. This course also led to a sharp rise in elevation, thus throwing altitudinal variation into the experiment. Trees of relatively uniform size and age were chosen in order to reduce "between trees" variation. These were felled on May 19th.

Emergence of the young adults occurred during the third week of May. A few were emerged on the date of felling, but peak emergence did not appear to occur until May 24th.

The six trap trees were examined on August 6th. Square-foot bark samples (12 inches by 12 inches) were removed at 5 feet above ground and at ten-foot intervals to the top of the tree. The samples were all cut from the upper sides of the horizontal boles. Two counts of Dendroctonus were taken. The number of entrances were recorded along with the number of whole or part egg galleries showing on the sample.

Results:

(1) At the date of examination, ^{Aug. 6} the beetles were found to be mostly in the mid-larval stage of development. Tree number 1, on the margin of the slash contained the largest larvae and had some pupae. This may have been due to higher temperature of this exposed bole. Living parent adults were exposed in three of the trees.

(2) A few Scolytus sp. were found in the upper portions of the boles and in the branches. A scattering of Buprestid larvae were also found.

(3) The results of the Dendroctonus tally are presented in Table 1, and Figure 2. The number of attacks increased from the boundary of the slash to a maximum at 20 chains south, and 250 feet above the starting point. No sign of Dendroctonus were observed in the trees at the 40 and 80 chain stations. The cambium of these trees remained white and moist except where a few Buprestids and Scolytus had entered.

(4) Of additional interest, but of questionable significance, is the pattern of attacks on the four infested trees. From Figure 3, it will be seen that the pattern exhibits considerable variation. Nevertheless, the average pattern indicates that intensity of attack is at a minimum at the butt, increases to a maximum at 25 feet, decreases to a point below the crown, and increases to another maximum in the mid-crown portion of the bole.

Discussion:

From the foregoing one might conclude that the Douglas fir beetle does not migrate more than about one-quarter of a mile in horizontal distance and not over 300 feet in altitudinal distance. However, from so limited an experiment, such an assumption would be dangerous. Population pressure, suitable host availability, local winds and topography, are factors that undoubtedly influence migratory distance of the beetle. It is sufficient to state that these were the results under these particular conditions. It will require a number of much more thorough experiments of this nature before speculation into the causal factors is justified.

The presence of traps close-in to broad source could have resulted in observed flight dist. pattern. Had traps begun at 40 or 80 chain interval the pattern might have "moved out" farther.

Table 1. Distribution of Dendroctonus pseudotsugae Hopk. attacks on six Douglas fir trap trees.

Tree No.	Dist. chains	DBH inches	Age (Yrs.)	Height (feet)	Height up bole (feet)								Tree Total	Av. per sq. ft.
					5	15	25	35	45	55	65	75		
1	0	14.8	115	90	<u>1</u> / 4 (1)	<u>2</u> / 9 (6)	No. attacks per sq. ft. 13 ^{6.5} (9)	6 ³ (3)	3 ^{1.5} (2)	5 ^{2.5} (4)	4 ² (3)	-	44 (28)	6.3 (4.0)
2	5	18.9	150	98	7 ^{3.5} (3)	9 ^{4.5} (7)	8 ⁴ (7)	11 ^{5.5} (6)	10 ⁵ (9)	12 ⁶ (7)	15 ^{7.5} (12)	13 ^{6.5} (1)	85 (62)	10.6 (7.8)
3	10	16.8	145	95	7 ^{3.5} (4)	9 ^{4.5} (5)	11 ^{5.5} (4)	12 ⁶ (7)	7 ^{3.5} (4)	10 ⁵ (11)	11 ^{5.5} (5)	7 ^{3.5} (2)	74 (42)	9.2 (5.3)
4	20	15.5	137	82	10 ⁵ (8)	11 ^{5.5} (8)	15 ^{7.5} (9)	11 ^{5.5} (3)	13 ^{6.5} (10)	15 ^{7.5} (12)	15 ^{7.5} (10)	-	90 (60)	12.9 (8.6)
5	40	14.4	134	89	0	0	0	0	0	0	0	0	0	0
6	80	14.4	127	85	0	0	0	0	0	0	0	0	0	0
Average		15.8	135	90	<u>2</u> / 7.0 (4.0)	9.5 (6.5)	11.8 (7.2)	10.0 (4.8)	8.2 (6.1)	10.5 (8.5)	11.2 7.5	10.0 6.5	-	

1/ No. of whole and part galleries in open numerals. No. of entrances in brackets.

2/ Averages of Trees 1-4

Figure 1. Location of Douglas Fir Trap Trees. Windermere Creek. 1952.

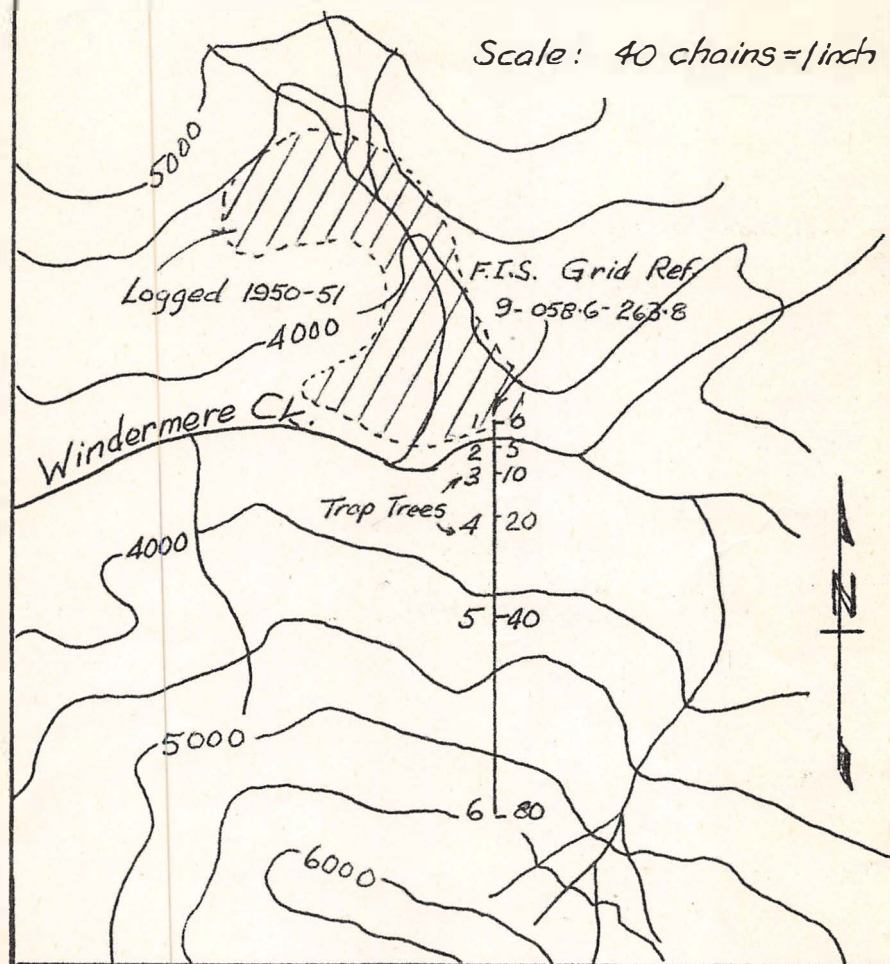


Figure 2. Diagram of Douglas Fir Beetle Spread From Margin of Logging Slash.

